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Title: Setting a direction – Hybride Hydrogels of Porous Organosilicate Nanoparticles and Thermoresponsive pNIPAM for the active directional transport of fluids

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ABSTRACT (Space limited to 2200 characters)

Active and directional transport of fluids is a topic of high potential as it is applicable in various fields such as medicine, water harvesting, oil and water separation and human water regulation. While nature has already developed solutions like spider silk or butterfly wings, the synthetical adaption of those systems is still very demanding. In this regard, stimuli-responsive materials are particularly useful as they provide systems with the ability to respond to external influences. However, fine-tuning of the interactions between the fluid and the transport medium is still challenging because the material chemistry requirements are very demanding. The material must have a directionality regarding the fluid transport, Its functionalization has to be highly flexible and it needs to be stimuli-responsive. In this article we present a new gradient hybrid hydrogel for the active directional transport of fluids based on porous organosilicate nanoparticles embedded inside a hydrogel forming a novel hybrid material.Porous organosilicate nanoparticles are covalently crosslinked with the thermoresponsive polymer pNIPAM. The directionality of fluid transport is generated by a concentration gradient of the particles along the Hydrogel. Unlike conventional crosslinkers, the particles offer the possibility of equipping the system with further capabilities via their pore system. By targeted functionalization of the pore surface, the interactions between the liquid and the hybrid material can be precisely tuned. Due to their enormously high adaptability, these hybrid hydrogels represent a new dimension of their kind contributing to an active and directional liquid transport which will be used in many future applications such as artificial veins or smart valves.